

gon.—Canyon City, 7.3; Joseph, 7.2; Sparta, 5.3. *Pennsylvania*.—Blue Knob, 11; Warren, 7; Grampian Hills, 6. *Rhode Island*.—Kingston (2), trace. *South Carolina*.—Camden, Cheraw, Chester, Effingham, Evergreen, Florence, Nichols, Simpsonville, Society Hill, Tillers Ferry, and Wateree, trace. *South Dakota*.—Webster, 13.1; Aberdeen, 13; Britton and Wolsey, 9; De Smet, 8.5; Clark, 8; Forest City and Huron, 7.5; Parker, 6.5; Howard, Tindall, and Wentworth, 6; Wessington Springs, 5.7; Castlewood, 5.5; Sioux Falls, 5. *Tennessee*.—Clarksville, 2. *Texas*.—Hartley, 0.2. *Utah*.—Soldiers Summit, 6.5. *Vermont*.—Burlington, Chelsea, Enosburgh Falls, and Strafford, 4. *Virginia*.—Clarksville, 14; Spottsville, 8.5; Birdsnest, 7.8; Bedford City, 7.5; Norfolk, 6.7; Cape Charles and Mossing Ford, 6; Danville, 5. *Washington*.—Pomeroy, 1.5. *West Virginia*.—Parkersburgh, 3.7. *Wisconsin*.—Bayfield, 10.2; Osceola Mills, 9; Barron, 7.5; Shell Lake, 6.5; Hammond, 5. *Wyoming*.—Fort McKinney, 20.6; Fort Yellowstone, 13; Sundance, 11.6; Laramie (2), 10.5; Cheyenne, 8.5; Casper, 8; Lander, 7.6; Wheatland, 6; Evanston, 5.8.

DEPTH OF SNOW ON GROUND ON 15TH AND AT THE CLOSE OF THE MONTH.

Chart VI shows the depth of snow on the ground at the close of the month, as reported by regular and voluntary observers of the Weather Bureau.

On the 15th a depth of 4 to 8 was reported in the eastern part of North Dakota and the northeastern part of South Dakota; 1 to 4 was reported in western Iowa; trace to 4 in northern Nebraska; depths varying from 0.4 at Miles City to 3 at Helena, Mont.; 0.5 at Denver, Colo.; 0.4 to 2.5 in northern Wyoming; trace to 1 in central and northern Nevada; 6 at Henrys Lake, Idaho; and 1.6 at Baker City, Oregon. In the Lake region trace was noted at Buffalo, N. Y., and Detroit, Mich.; 1 to 2 in upper Michigan; and 3 to 4 in the western Lake Superior region, and in the extreme upper Mississippi valley.

On the 30th snow was generally reported on the ground in the interior of the Atlantic coast states as far south as central South Carolina, in northern, central, and western New York, in the Lake region, the north part of the Ohio Valley, in the Mississippi Valley north of the 41st parallel, generally in Minnesota and the Dakotas, and in eastern Wyoming and the mountains of Colorado. In parts of North Carolina and Vir-

ginia a depth of 5 to 8 was reported; in northern New England and northern and western New York, 3 to 6; in lower Michigan, 5 to 7; in upper Michigan, 3 to 4; in Minnesota and the Dakotas, trace to 9; and in eastern Wyoming and the mountains of Colorado, trace to 5.

HAIL.

Description of the more severe hailstorms of the month is given under "Local storms." Hail was reported as follows: 1st, North Carolina. 4th, Indiana and Ohio. 6th, Indiana, North Dakota, Oregon, and Washington. 7th, Arkansas, Iowa, Michigan, Missouri, and Ohio. 8th, Arkansas, Illinois, Indiana, and Texas. 9th, Arkansas. 12th, New York. 13th, New York and West Virginia. 14th, Illinois, Kansas, and Missouri. 15th, Arkansas, Kansas, New York, and Washington. 16th, Arkansas, Illinois, and Texas. 17th, Arkansas, Indiana, New Hampshire, New York, and Pennsylvania. 18th, Missouri. 19th, Kansas and Texas. 20th, Kansas. 21st, Missouri and Texas. 22d, Illinois, Kentucky, and Missouri. 23d, Maryland, New Mexico, New York, Ohio, Pennsylvania, Virginia, and West Virginia. 24th, Kentucky and West Virginia. 26th, Kentucky, Maryland, and Mississippi. 29th, Maryland and North Carolina. 30th, North Carolina.

SLEET.

Sleet was reported as follows: 1st, New York. 2d, Kansas, Missouri, and Nebraska. 3d, Illinois and Kentucky. 4th, Arkansas. 5th, Pennsylvania. 6th, Washington. 7th, Pennsylvania and Utah. 8th, Pennsylvania and Texas. 9th, Louisiana and Pennsylvania. 10th, Minnesota. 11th, Wisconsin. 12th, Michigan. 14th, Illinois, Kansas, Missouri, Nebraska, Ohio, and Vermont. 15th, Indian Territory, Kansas, Ohio, Pennsylvania, South Dakota, and Wyoming. 16th, Arkansas, Illinois, and Washington. 17th, Colorado, Indiana, Massachusetts, New York, Ohio, Pennsylvania, Tennessee, and Washington. 18th, Arkansas, Kansas, Louisiana, Ohio, Texas, Vermont, and West Virginia. 19th, Arkansas, Illinois, Indiana, Iowa, Louisiana, Michigan, Mississippi, and Missouri. 20th, Ohio. 21st, Kansas and Missouri. 22d, Arkansas, Kansas, Missouri, and Vermont. 23d, Arkansas, Missouri, Ohio, and Pennsylvania. 24th, Nebraska. 25th, Arkansas and Ohio. 26th, Arkansas, Ohio, Pennsylvania, and South Dakota. 27th, Colorado, Maine, Ohio, and South Dakota. 28th, Maine, Mississippi, and Vermont. 29th, North Carolina and Virginia.

WINDS.

The prevailing winds in November, 1891, are shown on Chart II by arrows flying with the wind. In New England and the middle Atlantic states, over the southern plateau region, and on the middle Pacific coast west to northwest winds were most frequently noted; in the south Atlantic states and over the Florida Peninsula they were generally from northwest to northeast; in the east Gulf states, from north to northeast; in the west Gulf states, the Rio Grande Valley, the Ohio Valley and Tennessee, and over the northern plateau region, from southeast to south; in the lower lake region and on the north Pacific coast, from southeast to southwest; in the upper lake region, the upper Mississippi valley, on the southeast slope of the Rocky Mountains, and over the middle plateau region, from southwest to northwest; in the extreme northwest, the lower Missouri valley, on the middle-eastern slope of the Rocky Mountains, and along the south Pacific coast, from west to northwest; and on the southeast slope of the Rocky Mountains, variable.

HIGH WINDS.

[In miles per hour.]

Wind velocities of 50 miles, or more, per hour were reported at regular stations of the Weather Bureau as follows: 2d, 61, se., at Fort Canby, Wash. 3d, 62, s., at Fort Canby, Wash.

4th, 63, s., at Fort Canby, Wash.; 50, s., at Tatoosh Island, Wash. 5th, 50, s., at Fort Canby, Wash. 6th, 54, w., at Fort Canby, Wash. 7th, 63, ne., at Block Island, R. I.; 60, ne., at Block Island, R. I.; 54, ne., at Nantucket, Mass. 8th, 50, w., at Fort Canby, Wash. 10th, 60, nw., at Fort Assinaboine, Mont.; 50, nw., at Bismarck, N. Dak. 11th, 66, e., at Tatoosh Island, Wash.; 52, nw., at Valentine, Nebr. 17th, 54, sw., at Buffalo, N. Y. 18th, 52, nw., at Kitty Hawk, N. C.; 50, sw., at Dodge City, Kans. 19th, 51, s., at Chicago, Ill. 20th, 50, w., at Fort Canby, Wash. 21st, 60, nw., at Pueblo, Colo.; 50, nw., at Denver, Colo. 23d, 60, sw., at Buffalo, N. Y.; 60, sw., at Lexington, Ky.; 54, se., at Harrisburg, Pa.; 54, sw., at Washington, D. C.; 54, w., at Erie, Pa. 24th, 66, sw., at Buffalo, N. Y. 26th, 50, sw., at Chicago, Ill. 29th, 60, s., at Fort Canby, Wash.; 53, ne., at Kitty Hawk, N. C.; 50, n., at Hatteras, N. C.

LOCAL STORMS.

High wind and heavy rain prevailed on the Washington coast during the first decade of the month. Heavy rain fell over the Puget Sound watershed until the 9th; heavy snow in the mountains was melted; streams overflowed their banks, flooding bottom lands and causing considerable damage to railroad and private property. On the 3d the British ship

"Strathblane" was wrecked 12 miles north of Fort Canby, Wash., and the captain and 5 of the crew were drowned. The Nova Scotia bark "Sarah" was wrecked on the Vancouver shore about 20 miles northeast of Tatoosh Island, Wash., on the 8th.

6th.—A thunderstorm from the southwest began at Tatoosh Island, Wash., at 2.52 p. m., with high southwest wind and heavy hail.

7th.—At Dubuque, Iowa, a heavy thunderstorm, with rain and large hail, began during the early morning and continued at intervals until 5 a. m.; and during a thunder and rain storm which began 1 p. m. a building was struck by lightning.

8th.—At Louisville, Ky., a heavy thunderstorm occurred between 5 and 6 a. m. Lightning struck the Board of Trade building, and the Western Union Telegraph office on the 4th floor was destroyed by fire. Lightning also caused damage in the surrounding country.

9th.—During a high southwest wind at Helena, Mont., an extreme velocity of 60 miles per hour was reached. The wind caused a telephone wire to come in contact with the trolley wire of the electric street railway, and a number of telephones were burned out and the switchboard at the central office was injured. At Pensacola, Fla., the wind reached a velocity of 41 miles per hour from the northwest at 11.05 p. m. The four-masted schooner "Maud McLean" was abandoned in a sinking condition about 90 miles west by south from Pensacola.

10th.—At Bluefield, W. Va., a brick building in course of erection was blown down during a heavy windstorm. At Blue Knob, Pa., a gale, with wind 35 to 45 miles per hour, and heavy clouds scudding toward the northwest, began at noon. At 6 p. m. the wind veered from east to southeast and reached 50 to 60 miles per hour, in squalls, prostrating trees, etc. The storm continued until midnight. At Detroit, Mich., a severe rainstorm prevailed, with southwest wind reaching a velocity of 45 miles per hour at 11 p. m.

11th.—At Ithaca, N. Y., a heavy rainstorm, with high south wind, began 2 a. m. and ended 7 a. m., causing minor damage to roofs and chimneys. At Detroit, Mich., a gale prevailed throughout the day. Many casualties were reported on the Lakes, and 13 vessels were reported disabled. At Alpena, Mich., the wind reached a velocity of 35 miles per hour at 7.30 a. m. At Pierre, S. Dak., a windstorm, with light, dry snow, continued during the morning. At Grand Rapids, N. Dak., a wind and snow storm began 11 a. m., and continued 4 hours; the storm was followed by a severe cold spell. At Valentine, Nebr., high northwest winds, reaching a velocity of 52 miles per hour, prevailed; trees were blown down, and a number of houses were unroofed.

16-17th.—At Cleveland, Ohio, high southeast to southwest winds, with rain at intervals, prevailed during the 16th. The rain changed to snow 7.38 a. m., 17th, and the storm continued during that date. At Detroit, Mich., a gale, reaching a velocity of 39 miles per hour, prevailed during the 16th. The rain changed to snow 12.20 a. m., 17th, and the snow ended 7.25 a. m. The snow began again at 10.05 a. m., and continued at intervals until 6.30 p. m. On this date the wind reached a velocity of 48 miles per hour, and many disasters were reported on the Lakes.

17th.—The Bulletin of the New England Meteorological Society states that a short-lived tornado occurred at Monroe, Mass., in the afternoon; that it passed north-northeast, prostrating a heavy growth of timber, and cutting a track about 8 rods in width and 40 rods in length; and that some of the trees were broken off and others torn up by the roots. At Portland, Me., a severe windstorm, with light rain, prevailed during the day. A storm from the northwest damaged property at Groveton, N. H. The roof of a lumber shed was blown off, killing one man and injuring another. At Brattleborough, Vt., a wind velocity of 78 miles per hour was reported. At Blue Hill, Mass., the wind reached a velocity of 59 miles per hour. At Boston, Mass., a windstorm began in the early morning, and

increased in force from 2 to 4 p. m., reaching a velocity of 48 miles per hour from the southwest. Rain fell during the day, changed to sleet in the evening, and the sleet continued until 8.30 p. m. At New Haven, Conn., rain, with high south winds reaching a velocity of 39 miles per hour, continued during the day. Minor damage was caused to buildings and trees, seaside property was injured, and a sloop and several smaller boats were wrecked at Oyster Point. At New London, Conn., high wind, with rain at intervals, prevailed, and the sea was very rough in the harbor and on the Sound. Summer cottages at Eastern Point were injured; bridges were carried away and docks damaged; waves washed over the railroad track at Niantic; and a three-masted schooner went ashore on Fishers Island. At Philadelphia, Pa., light rain fell at intervals, with high south winds changing to southwest at 11 a. m., and to northwest at 1.30 p. m., with a maximum velocity of 40 miles per hour. With the change of wind the barometer, which had been falling all day, began to rise rapidly, and the temperature fell 17° in one hour. Minor damage was caused by a windstorm at Darlington, Md. A violent wind and rain storm was reported at Hagerstown, Md.

At Buffalo, N. Y., rain fell in the morning and snow in the afternoon. A gale from the southwest began 11.55 p. m., and reached a velocity of 54 miles per hour, causing minor damage. The water in the lake rose 4 feet during the gale, and a number of boats which attempted to leave were compelled to seek shelter behind the breakwater. The storm was reported the heaviest of the season at Grand Haven, Mich.; high westerly wind, with heavy squalls of snow, prevailed; business was interfered with, and vessels could not cross the bar owing to the heavy sea. At Manistee, Mich., high northwest wind, with snow, at intervals, prevailed. The schooner "Hattie Estelle" was wrecked north of the north pier. The vessel and cargo were a total loss; 3 of the crew perished, and 4 were rescued by the Life Saving Service.

19th.—At Grand Haven, Mich., southerly winds attained a velocity of 36 miles per hour. A heavy gale and high seas prevailed on the Lake and no vessels left port. A heavy southwest gale prevailed over Lake Huron and Saginaw Bay.

21st.—At Detroit, Mich., a severe gale, with rain, prevailed, the wind reaching a velocity of 48 miles per hour from the southwest at 4.12 p. m. The gale was very severe on the Lakes, and many disasters were reported. The crew of the schooner "Finney" was drowned. At Wichita, Kans., the wind reached a velocity of 47 miles per hour from the north. High winds caused minor damage in eastern Colorado.

22d.—At Soapstone Mount, N. C., a rainstorm from the south, with wind reaching 40 miles per hour, caused damage to buildings, etc. A severe windstorm caused damage in central and eastern Mississippi. At Vicksburg, Miss., a thunderstorm began 2 p. m., and lasted 20 minutes, with west wind, reaching a velocity of 42 miles per hour, and a temperature fall of 26°. A report from Lawrence, Miss., stated that a storm struck that place about 3 p. m., destroying several buildings and killing a child.

23d.—The following reports, taken on 75th meridian time, show the time of occurrence and the general character of the storms which attended low area X: At Charlotte, N. C., rain ended 7.20 a. m. At 6 a. m. a brisk southwest wind began and increased to a gale, with maximum velocity 48 miles per hour, and continued until late in the afternoon, without causing serious damage. At Raleigh, N. C., rain began during the early morning. From 8 a. m., 22d, to 8 a. m., 23d, the barometer fell .40 inch. A gale began 10.15 a. m. and ended 2.05 p. m. A violent squall at 10.30 a. m. blew down a tree, fatally injuring 2 children. Considerable damage was caused by wind at Saxon, N. C. At High Point, N. C., a heavy rainstorm advanced from the southwest at 9 a. m. At Lynchburgh, Va., rain fell at intervals until 10 a. m., and high southeast to southwest winds continued during the morning, causing minor damage. A storm from the southwest struck Staunton, Va., at 10.20 a. m., damaging property to the value of about \$1,000. Heavy wind

At 12.45 p. m.

and rain storms, attended in instances by hail, visited the several sections of Virginia. A severe windstorm, with rain, was general throughout West Virginia. At Buckhannon a large tannery in course of construction was blown down. At Kingwood glass was broken by hail. At Tannery a severe thunderstorm from the southwest, with high wind, prostrated buildings and trees. A storm visited Martinsburgh at 12.15 p. m. At Parkersburgh the wind reached a velocity of 30 miles per hour from the west, with heavy rain and snow; an old house was blown down, and trees were damaged.

A violent wind and rain storm, with some thunder and lightning, struck Washington, D. C., at 12.33 p. m. The wind reached a velocity of 54 miles per hour, with an extreme velocity of 60 miles for 3 minutes, the temperature fell 14°, and 0.35 inch of rain fell in 5 minutes. A large unfinished building collapsed, crushing parts of adjacent buildings, in one of which one man was killed and 2 girls were injured. A number of buildings were unroofed, and damage of a minor character was caused in and about the city. The pressure fluctuations which attended the passage of this storm are shown by a copy of the barograph record at the Weather Bureau office in Washington which appears in the description of low area X. The storm appeared as a long roll or mass of dark clouds which advanced rapidly from the southwest, following closely the shift of wind to that quarter. During the brief period of the storm's continuance the wind gusts were exceptionally violent and the rainfall remarkably heavy, and its passage was followed by rapidly clearing weather and warm sunshine.

At Baltimore, Md., a windstorm, with light rain and thunder, prevailed from noon to 2 p. m., a maximum velocity of 48 miles per hour from the south being reached at 1.15 p. m. Considerable damage was caused by wind in and about the city and throughout Maryland. At Frederick a violent storm of wind and rain, with thunder and lightning, advanced from the south about noon, unroofing and blowing down a number of buildings. At Frostburgh a storm of wind, heavy rain, hail, and thunder and lightning moved north of east at 11.10 a. m., damaging property to the estimated value of \$35,000. About \$2,000 damage was reported at Jefferson. Considerable damage to buildings was reported in Montgomery, Charles, and Carroll counties, Md. At New Market the storm was attended by hail, and continued 15 minutes from about 12.15 p. m. The storm struck Middletown at 12.30 p. m., from the southwest, causing damage to the extent of about \$1,500. At Cumberland a severe rainstorm, with heavy gusts of wind from the south veering to southwest, began about 11 a. m. At 11.15 a. m. there were several claps of thunder.

The storm was violent throughout Pennsylvania. Strong southerly winds prevailed, and in many sections thunder, lightning, and hail were reported. The storm attained destructive violence for short periods only, and in many places lasted but a few minutes. At Harrisburg a severe gale from the south, with a maximum velocity of 54 miles per hour, sharp flashes of lightning, heavy peals of thunder, and heavy dashes of rain, began about 1.40 p. m., lasted 7 minutes, and caused a great amount of damage to buildings. A destructive wind and rain storm, with thunder and lightning, entered the southwest part of York county, Pennsylvania. At York, that county, the storm was most severe about 11 a. m., and continued until 4 p. m.; it recommenced in the evening, and subsided about midnight. At Blue Knob a heavy thunderstorm, with hail and sleet, and wind reaching a velocity of 60 miles per hour from the southwest, began at 11.30 a. m. Snow began at 8 p. m., and the wind continued heavy. At Philadelphia the wind shifted to northwest, with a heavy shower of rain at 4.30 p. m. The wind continued high about 20 minutes. At Hanover a storm from the southwest, with heavy rain, thunder, and lightning, occurred about 1 p. m., demolishing a large brick building, and killing one person.

A storm from the southwest struck Carlisle about 1.30 p. m., blowing down a schoolhouse, and injuring a number of persons.

A severe thunder and rain storm, with small hail, moved eastward over Lock Haven about 12.30 p. m. A heavy rain and wind storm visited Blooming Grove about 3 p. m. A very heavy rainstorm, with strong gusts of wind, occurred at Dyerberry at 3.45 p. m. A rainstorm, with high southwest wind, visited Tioga county, Pa., at 1.40 p. m., and lasted about 20 minutes, killing one person, and causing much damage to buildings. At Pittsburg the barometer fell rapidly until 10 a. m., when it reached 29.08, the lowest reading on record at the Weather Bureau station at that place, except a reading of 29.01 on January 27, 1889. At 10 a. m. the wind reached a velocity of 30 miles per hour from the southwest, and 0.49 inch of rain fell in 10 minutes. Much damage was done in and about the city, telegraphic communication was seriously interrupted, and railroad traffic was delayed. The storm was one of the severest ever experienced at Erie. The barometer fell to 28.92 at noon, rain, snow, and sleet fell, and the wind reached a velocity of 51 miles per hour from the southwest at 8.55 p. m., causing much damage to buildings and shipping.

The storm was very severe over western New York. At Buffalo a gale began at 1.08 p. m., with maximum velocity 60 miles per hour, and continued during the 24th, on which date a velocity of 66 miles per hour was recorded. The storm was the most severe of the season, and caused considerable damage in that section. At Oswego a gale began at 11.27 a. m. and ended 3.51 p. m., reaching a velocity of 40 miles per hour. A second gale began 9.45 p. m. and ended 11.24 p. m. The fall of the barometer was very rapid, and at 3.35 p. m. it reached 29.04. A heavy south wind struck Addison at 2 p. m., and 0.30 inch of rain fell in 5 minutes. A strong gale was reported at Alfred Centre at 3 p. m. At South Canisteo heavy southwest wind damaged buildings, and 0.25 inch of rain fell from 1.50 to 1.53 p. m. At Wedgwood the wind veered from southeast to southwest at 2.15 p. m., with heavy rain, thunder, and a dash of hail. The gale lasted 12 minutes, and the rain ceased at 3 p. m.

At New York City the wind reached a velocity of 48 miles per hour from the southeast at 4.10 p. m., and the weather was very severe over the rivers, Sound, and Bay. At Cleveland, Ohio, the barometer fell rapidly during the early part of the day, and at 12.30 p. m. it read 28.14 (actual), the lowest reading on record at that station. Rain began at 1.15 a. m., accompanied by high southeast backing to northeast and northwest winds. No serious damage was reported. At Ashville, Ohio, a violent hailstorm was reported in the early morning, followed by rain until 9.30 a. m., when the rain changed to snow, and the wind reached a velocity of about 50 miles per hour by 2 p. m. Heavy wind and snow storms were reported throughout northern Ohio.

26th.—At Alpena, Mich., a gale began 9.30 a. m., lasted 2 hours, and attained a velocity of 30 miles per hour from the south. About 2 p. m. a steambarge and 3 consort barges were swamped while crossing Saginaw Bay.

29th.—At Cape Henry, Va., the wind reached a velocity of 50 miles per hour from the northwest at 9.37 a. m. Snow, with sleet, fell to the depth of 3 inches. High winds prevailed along the North Carolina and Virginia coasts. A report from Alpena, Mich., stated that 2 barges ran ashore near Presque Isle during a snowstorm.

VERIFICATION OF WIND SIGNALS FOR OCTOBER, 1891.

Statement showing percentages of justifications of wind signals for the month of October, 1891.

Wind signals.—(Ordered by Professor H. A. Hazen.)—Total number of signals ordered, 165; justified as to velocity, wholly, 108, partly, 11; justified as to direction, 155. Of the signals ordered, 131 were cautionary, of which 82 were wholly, and 7 partly, justified; and 34 storm signals were ordered, of which 26 were wholly, and 4 partly, justified; 69 signals were ordered for easterly winds, of which 59 were justified, and 96 were ordered for westerly winds, all of which were justified. Number of winds without signals, 27. Number of signals ordered late, 24. Percentage of justifications, 69.9.

VERIFICATION OF COLD-WAVE SIGNALS FOR OCTOBER, 1891.
Cold-wave signals.—(Ordered by Prof. H. A. Hazen.)—

Twenty cold-wave signals were ordered during October, 1891, 8 of which were justified. Percentage of justifications, 40.

INLAND NAVIGATION.

ICE IN RIVERS AND HARBORS.

Hudson River.—The first ice of the season formed at Albany, N. Y., on the 30th.

Detroit River.—Large quantities of floating ice were reported at Detroit on the 30th.

Grand River.—The river was frozen at Lansing, Mich., on the 29th.

Black River.—At Port Huron, Mich., thin floating ice was reported on the 19th; floating ice on the 28th; on the 29th the river was covered with very thin ice; floating ice on the 30th.

Fox River.—Ice 7 inches in thickness was reported at Appleton, Wis., on the 30th.

Wisconsin River.—The river was frozen on the 18th.

Manitowoc River.—At Manitowoc, Wis., the river was closed on the 18th; it was open on the 21st, and again closed on the 25th.

Red River of the North.—At Saint Vincent, Minn., persons were crossing the river on the ice on the 17th, and on the 19th teams were crossing.

Mississippi River.—At Saint Paul, Minn., the river was gorged with ice and frozen from the Robert street bridge as far up as could be seen on the 19th; below the bridge the river was open. On the 27th the river was gorged with ice, except at the foot of Jackson street. At Red Wing, Minn., the first ice of the season appeared on the 17th; on the 18th the river was frozen over, and the ferry boats had stopped running; on the 20th the ice was broken up and ferry boats resumed their trips; on the 24th the river was frozen during the night, but the ice was broken by the current and high wind; on the 25th the river was again frozen over. At La Crosse, Wis., floating ice was reported on the 17th; on the 18th the river was gorged with ice above the town; on the 21st the river in front of town was clear of ice; on the 27th the river was closed by ice. At Dubuque, Iowa, the river was full of ice above the bridge on the 24th; on the 28th the river was frozen over. At Le Claire, Iowa, the river was frozen on the 18th; on the 21st the ice was breaking up; the morning of the 25th the river was frozen, but the ice broke up in the afternoon; on the 29th the river was frozen. At Davenport, Iowa, the river was frozen on both shores and was full of floating ice on the 17th; river full of floating ice on the 18th and 20th; continued full of floating ice until the 29th, when it froze over, and on the 30th persons were crossing on the ice. The river was frozen at Muscatine, Iowa, on the 16th. Floating ice was reported at Warsaw, Ill., on the 29th, and at Alton, Ill., on the 30th.

Illinois River.—At Ottawa, Ill., the river was frozen on the 19th; on the 20th the ice ran out, and on the 28th the river was frozen.

Missouri River.—At Fort Buford, N. Dak., the river was frozen on the 14th. At Pierre, S. Dak., ice was running in the river, with solid shore ice, at 1 a. m., 12th, and at 9 a. m. the shore ice was strong enough to bear the weight of a man, and traffic was suspended above the pontoon bridge; on the 13th ice was running in the river, the shore ice was extending, and the pontoon bridge was closed to traffic; on the 14th ice was running, and an ice gorge had formed north of the end of the pontoon bridge; on the 15th the east side of the channel was frozen over, and ferry boats were tied up for the season; on the 24th persons were crossing on the ice above the pontoon bridge. At Sioux City, Iowa, ice was running in large quantities from the 13th to 15th, and on the 25th the river was frozen over, closing navigation. At Saint Joseph, Mo., ice was running in the river on the 17th; on the 18th the river was blocked with ice; on the 28th it was clear of ice; and on the 30th running ice was noted. At Leavenworth,

Kans., the river was full of floating ice on the 17th, and the ice was sufficiently heavy to break the pontoon bridge; the river was full of floating ice on the 18th and 19th.

On the 30th ice in the canals of New York interfered with navigation. A report from Albany, N. Y., stated that all canals, except the Erie, were to be closed for the season at midnight.

CLOSING OF NAVIGATION.

Navigation closed at Green Bay, Wis., on the 30th. Navigation closed on the Fox River, Wis., on the 25th. Navigation closed on the Mississippi River at Dubuque, Iowa, on the 15th. Navigation closed on the Missouri River at Sioux City, Iowa, on the 25th.

LOW WATER.

Navigation on the Ohio River, which had been suspended on account of low water between Pittsburg, Pa., and Cincinnati, Ohio, from September 14th, and between Pittsburg, Pa., and Wheeling, W. Va., from September 24th, was resumed on the 23d. A report of the 18th stated that the Red River was exceptionally low at Shreveport, La., and that boats were unable to run. The Detroit and Saint Clair rivers were very low on the 17th. At Chattanooga, Tenn., the Tennessee River rose after the 14th, and boats resumed their trips by the 25th.

FLOODS.

Heavy rain during the first decade of the month caused destructive floods in the streams of northwestern Washington. Railroads were washed out, telegraphic communication was interrupted, and bridges were carried away.

STAGE OF WATER IN RIVERS.

In the following table are shown the danger-points at the various river stations; the highest and lowest stages for the month, with the dates of occurrence, and the monthly ranges:

Heights of rivers above low-water mark, November, 1891 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River.</i>						
Shreveport, La.	29.9	1	—0.7	15-17, 19, 20	—1.7	1.0
<i>Arkansas River.</i>						
Fort Smith, Ark.	22.0	13	3.7	8, 9	1.0	2.7
Little Rock, Ark.	23.0	24	7.2	11, 12, 13	2.7	4.5
<i>Missouri River.</i>						
Fort Buford, N. Dak.						
Sioux City, Iowa						
Kansas City, Mo.	21.0	2	6.4	24, 25	3.7	2.7
<i>Mississippi River.</i>						
Saint Paul, Minn.	14.0	1	1.3	18	0.1	1.2
La Crosse, Wis.	11.8	21, 22	2.2	10-17	0.5	1.7
Dubuque, Iowa	16.0	1, 2, 8, 9	1.9	26	1.1	0.8
Davenport, Iowa	15.0	1	1.1	28	—0.2	1.3
Keokuk, Iowa	14.0	1	0.7	29	—1.2	1.9
Saint Louis, Mo.	30.0	25	5.9	30	4.0	1.9
Cairo, Ill.	40.0	30	15.0	6, 7	2.4	12.6
Memphis, Tenn.	33.0	30	8.3	8, 9	1.0	7.3
Vicksburg, Miss.	41.0	30	3.9	16, 17, 18	—2.5	6.4
New Orleans, La.	13.0	9	3.9	15, 16	2.2	1.7
<i>Ohio River.</i>						
Parkersburg, W. Va.	38.0	26, 27	14.6	10, 11	2.7	11.9
Cincinnati, Ohio	45.0	29	24.6	2	4.5	20.1
Louisville, Ky.	24.0	30	10.3	1, 2, 3	3.0	7.3
<i>Cumberland River.</i>						
Nashville, Tenn.	40.0	23	11.3	2-9	0.0	11.3
<i>Tennessee River.</i>						
Chattanooga, Tenn.	33.0	26	6.7	4-10	1.2	5.5
<i>Monongahela River.</i>						
Pittsburg, Pa.	29.0	25	13.0	7	5.7	7.3
<i>Savannah River.</i>						
Augusta, Ga.	32.0	25	15.8	2, 8	5.5	10.3
<i>Willamette River.</i>						
Portland, Oregon	15.0	5	5.3	1, 2	2.8	2.5
<i>Susquehanna River.</i>						
Harrisburg, Pa.	17.0	26	6.5	9, 10, 11	2.0	4.5
<i>Alabama River.</i>						
Montgomery, Ala.	48.0	30	3.5	1-8	—0.3	3.8

* Record incomplete. † For 24 days.